Surgical Education on a Fixed Income

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The pace of change in our modern world is swift. Medicine—and medical education in particular—are not immune. Program Directors and Graduate Medical Education Committees are inundated by proposed initiatives and published requirements by our certifying and accrediting bodies. The impact of each change (whether related to duty hours, clinical experience, documentation, or other less tangible issues) must be assessed in the setting of current program structure and available local resources—which may be limited in some programs.

Two reform initiatives in the past decade have dramatically changed General Surgical education. The first initiative, driven externally by pressure from public safety proponents and the press, was the 80 hour a week residency duty restriction instituted in 2003. The second initiative, driven internally through the **Accreditation Council for Graduate Medical Education (ACGME)**, was the educational reform initiative of the six core competencies, discussed elsewhere in this issue. While the 80-hour restriction has been the stronger driver of change, both of these initiatives have had a significant impact on the training of future surgeons. These changes forced a careful assessment of the "core business" of surgical education and a redesign of surgical residency training to maximize efficiency. Moving from the traditional apprenticeship model of training, where residents participated in all aspects of surgical care required to become a competent surgeon without concern for the hours of training, surgical educators have had to evaluate the specific educational value of each resident's experience. As the curriculum becomes more streamlined, educators are forced to make difficult choices—e.g.,if something is to be added, what is to be discarded?

Even before the changes of the last ten years, graduate surgical education in the United States was one of the best systems in the world. The structure of the training was built on the principles described by Dr. William Halstead in 1910-1920, which emphasized a supervised, intense patient care experience and ascending levels of responsibility over the period of training. Most surgical training programs in the US were built around five years of clinical experience on busy clinical services, augmented by selected educational conferences. Since there were no duty hour restrictions many surgery residents worked more than 100 hours a week. This intense workload assured a comprehensive surgical experience and development of competence in all aspects of surgical care, including recognition and treatment of postoperative complications.

The reduction of duty hours has led to a curtailing of the number of patient encounters and technical experiences. Opponents of the duty hour restriction argued that this would weaken the educational process and lead to production of a less qualified surgeon at the end of five years of residency training. Some surgeons feel that residency should be extended to six or seven years to compensate for the loss of clinical experience, but the funding for these additional years is non-existent. Program directors were left with a choice between eliminating redundant or non-essential experience from the curriculum or adding physician extenders to the clinical services, such as nurse practitioners and physician assistants. Adding these practitioners has resulted in less clinical experience for the surgery resident. Most surgical training programs have instituted a combination of these two choices. It is estimated that the 80-hour work week cost the medical system two billion dollars a year in increased salaried positions. The total cost since its inception is over 16 billion dollars. Though very expensive, the result of this reform is a more intentionally built educational process. One could say that surgery residents are working "smarter, not harder." This process is akin to balancing a household budget, but instead of money, surgical program directors balance duty hours based on the educational needs or priorities of the residents. There are concerns that clinical experiences have been cut too severely and that the residents are not as prepared at the end of their training to practice independently. There appears to be some data to support this contention especially from European centers where duty hour restrictions have a longer history.[1] Residents themselves are increasingly choosing to pursue fellowship training. This decision may reflect their sense that they have not mastered the body of knowledge and that they require further time in a supervised educational experience.

As mentioned previously the 80-hour work week was intended as a patient safety initiative. Many patient safety advocates and the lay press have proposed that the tired resident was, to a large degree, responsible for poor patient outcomes. The logic was that a fatigued resident, who is often compared to an inebriated person, is prone to judgment and technical errors that will cause harm to patients. However, there is no clear evidence that the reduction of resident duty hours has improved patient safety. The most definitive study on this is a study in 8.5 million hospitalized Medicare beneficiaries.[2] The authors classified five levels of hospitals based on degree of resident density. They performed a risk-adjusted analysis of mortality in these five groups of hospitals for three years before and two years following the 2003 duty hour mandate. Their hypothesis was that duty hour restrictions and (thereby) less fatigued residents should benefit patient safety. Therefore, a disproportionate improvement in outcomes should be witnessed in the hospitals with the highest density of residents. What they found was that all hospitals showed modest improvements in outcomes but that there was no difference among the five groups. It appears that all hospitals, regardless of resident penetrance, are improving the care delivered, likely the result of the myriad initiatives for improving outcomes in medicine. An interesting conclusion drawn from this study is that excessive duty hours and resident error do not appear to be the primary problem for patient safety as was once thought. The explanation is either that the system of care delivered in American hospitals has checks and balances such that fatigued residents are not allowed to harm patients, that residents

are still too fatigued and that further reduction in duty hours are needed before a benefit in terms of patient safety can be seen, or that while fatigue was reduced, another problem may have been created or accentuated. There is no consensus as to what the etiology may be, but many commentators believe that byproducts of the duty hour restriction are shorter shifts and more reliance on sign out or transitions of one care team to another care team. Sign-outs require good communication, and poor communication is the number one cause of medical error. In solving one problem another may have arisen. One study evaluated the quality of sign-out between residents by interviewing groups of residents before and after signouts to the next care team by researchers. The most alarming fact of the study was that when resident A signed out to resident B, what A felt was the one most important fact that A wanted to impart to resident B, was recalled by resident B only 40% of the time. To solve this problem is difficult. If enough time is provided to perform sign-out, this time takes away from direct patient care, an essential part of training. Even if enough time for sign-out is provided, is critical data passed along? Do patients get better care from someone who knows the patient better but is fatigued or from someone who is rested but does not know the patient as well? Obviously all patients would prefer to be cared for by someone who knows them well and who is well rested. How is this accomplished? There may be technical solutions—e. g., we have an electronic sign-out system at Rhode Island Hospital which carries critical information and keeps up-to-date medications and laboratory values. The **electronic medical record** (**EMR**) may be a solution but the user interfaces of these systems are often so cumbersome that they reduce physician efficiency rather than improve it.

An area that many programs, including our training program, are exploring is to improve the sign-out accuracy. Each morning our trauma service at Rhode Island Hospital, which admits over 3,000 patients a year with traumatic injuries, convenes to discuss all of the new patients admitted the night before and the current inpatient census. In order to do this rapidly and accurately the residents are supervised by faculty who can offer comments, instructions, and assess the thinking and judgment of the resident team as they sign-out to each other. This morning report is a significant investment of time and energy of the trauma faculty, but this process has become vital for the process of patient care and resident education. We are currently investigating whether we can improve the communication skills and teamwork skills of the trauma residents in the Rhode Island Hospital trauma bays. These experiences can be superficially duplicated in a simulation center but the reality of the trauma bay creates a better educational environment. With the faculty present, the residents care for the patient and are simultaneously evaluated for their ability to arrive at an accurate diagnosis and their ability to communicate effectively with all members of the team.

One proposed solution to the current challenges of surgical education is simulation training.

One proposed solution to the current challenges of surgical education is simulation training. Simulation training has been shown to have great impact on aviation safety and this same process may be similarly successful in surgery. It is reasoned that surgery is a highly technical field and therefore applicable to this technology. There are two errors in this thinking: the first is that technical errors are the major cause of complications in surgical patients, and second is that surgical education is primarily training in technical expertise. Surgeons with good clinical outcomes share technical proficiency, but more importantly good clinical judgment. They know when to operate, when not to operate, and how to manage complications when they arise. The current state of surgical simulation is very primitive and not yet able to address these issues.[3] With continued innovation and significantly more financial investment, surgical simulation will one day be a useful adjunct to surgical training, but currently the technology is far behind and the data supporting its routine use weak. One additional unintended consequence of simulation training is that it pulls surgery residents from the most important person—the patient. In thinking about surgical training and the educational budget, every hour on an inadequate simulator is an hour away from learning from direct patient care.

At some point chairmen of surgery and program directors in surgery have to put their imprimatur on the resident and certify him or her as trained. Therefore during their training residents must be given ascending levels of responsibility under supervision so that their judgment can be assessed. This is where the conflict between resident education and patient safety is most acute. Training programs in surgery have years of experience managing this conflict. Systems of education, supervision, and dedication to excellence allow us to offer an ascending level of responsibility simultaneous with provision of quality patient care. The six ACGME core competencies on which all programs teach and evaluate residents—patient care, medical knowledge, communication, professionalism, system-based practice and practice-based learning—forced program directors a decade ago to look at all areas of competency and not just the areas that would normally draw the closest scrutiny—knowledge and patient care. Before the introduction of the six core competencies, training programs certainly taught and evaluated residents in these domains, but a more precise definition of these areas challenged modern program directors to refine their methods. For instance, practice-based learning, which is the ability to learn from patient outcomes and improve patient care, was generally covered in surgical curriculum by a journal club where articles covering state-of-the-art science were discussed. The assumption was that this teaching would diffuse into the care of the patients. Our solution to the new requirements for practice-based learning at Brown is to have all PGY2 residents do a two-year quality improvement project with faculty proctoring. This allows an identification of a current clinical problem, a review of the current literature, collection of data, and designing and implementing a solution to the problem based on lessons learned from the project. This process is educational,

sets an expectation of future behavior and improves the care of patients. This process is one of many examples of the benefits of modern surgical education and their impact on teaching hospitals.

The 80-hour work week was an expensive, radical challenge to surgical education. Though there have been some significant unwanted and pernicious changes because of its promulgation, surgical education benefited from the house-cleaning or the budget-balancing that it engendered. These duty hour restrictions demand that program directors understand that they are working on a fixed income. Further challenges to the surgical curriculum await. The introduction of the electronic medical record, which currently reduces clinician efficiency, will put additional time pressure on surgical house officers. This July, new ACGME rules will limit PGY1 residents to 16 hour shifts and increase the requirement for their supervision. Further reductions to the limit of 80 hours might also be in the future. Surgical programs that are more intentionally designed and based on sound educational principles, will be better equipped to face these challenges. The programs will be filled with excellent residents, for the number and quality of applicants to surgery programs has increased. The last ten years have been a real challenge but the future is bright. Don't worry, there will be a well-trained surgeon there when you need one.

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Disclosure of Financial Interest

The authors and/or their spouses/significant others have no financial interests to disclose.

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